APPENDIX X – ASPEN GROVE - WESTHAVEN 161-KV TRANSMISSION LINE HARPETH RIVER EROSION CONTROL PLAN

The construction of the Aspen Grove - Westhaven 161-kV Transmission Line would require three crossings of the Harpeth River. Beginning at the existing Aspen Grove Substation, these transmission line crossings are identified east to west as crossings 1, 2, and 3 (Figure X-1). Each crossing would require the consideration of best management practices and/or bank stabilization for two 100-foot sections of riverbank (one on each side of the river at the crossing). These six riverbanks are identified as 1-East, 1-West, 2-East, 2-West, 3-East, and 3-West.

Removal of vegetation, including trees, would be needed along the transmission line right-of-way to maintain adequate clearance between tall vegetation and transmission line conductors, as well as to provide access for equipment during the transmission line construction. Additional details can be found in Section 2.4.1.2 Right-of-Way Acquisition and Clearing of the Aspen Grove - Westhaven 161-kV Transmission Line Environmental Assessment. For the transmission line construction in streamside management zones and wetlands, vegetation removal would be restricted to trees tall enough, or with the potential soon to grow tall enough, to interfere with conductors.

Tree root systems are important in preventing erosion and bank slumping along rivers and streams. This is especially true for the Harpeth River because of the silty soil composition and high, steep banks located along some stretches of the river. Tree roots reinforce the soil by holding it together, and the tree mass adds weight, which increases the amount of friction at potential riverbank failure surfaces. The stabilizing influence of the trees has probably allowed the formation of the Harpeth River stream banks to their current height.

The removal of trees on the banks where the transmission line crosses the river increases the chances of bank slumping and contamination of the river with sediment (Figure X-2). This is particularly true of riverbanks at one of the river crossings (3-East and 3-West) and possibly at a second crossing (2-West). Observation of the Harpeth River stream banks in this area revealed several existing localized slumps near the proposed transmission line crossings. Crossing 2-West has bedrock, which may help stabilize the bank; crossing 2-East has much lower banks and extensive bedrock. Crossings 1-East and 1-West are at an existing transmission line, and the banks are less steep.

In order to prevent stream bank failure beneath the transmission lines where vegetation such as trees with large root systems have been removed, rock would be placed at the bottom of the slope (Figure X-3). The weight of the rock would prevent bank failure by increasing the friction at the potential failure surface. Furthermore, any earth slide or slumping would have to overcome the inertia of the rock mass.

Rock would be placed from the stream bottom to about one-third the height of the bank. For bank stabilization at the transmission line crossings, 1- to 2-foot diameter or larger rock would be used; whereas, for conventional bank stabilization projects, riprap rock would typically utilize 6- to 8-inch diameter rock. Benefits of the larger rock would include larger void spaces that would be backfilled with soil and planted with native plants, including selected low-growing shrubs.

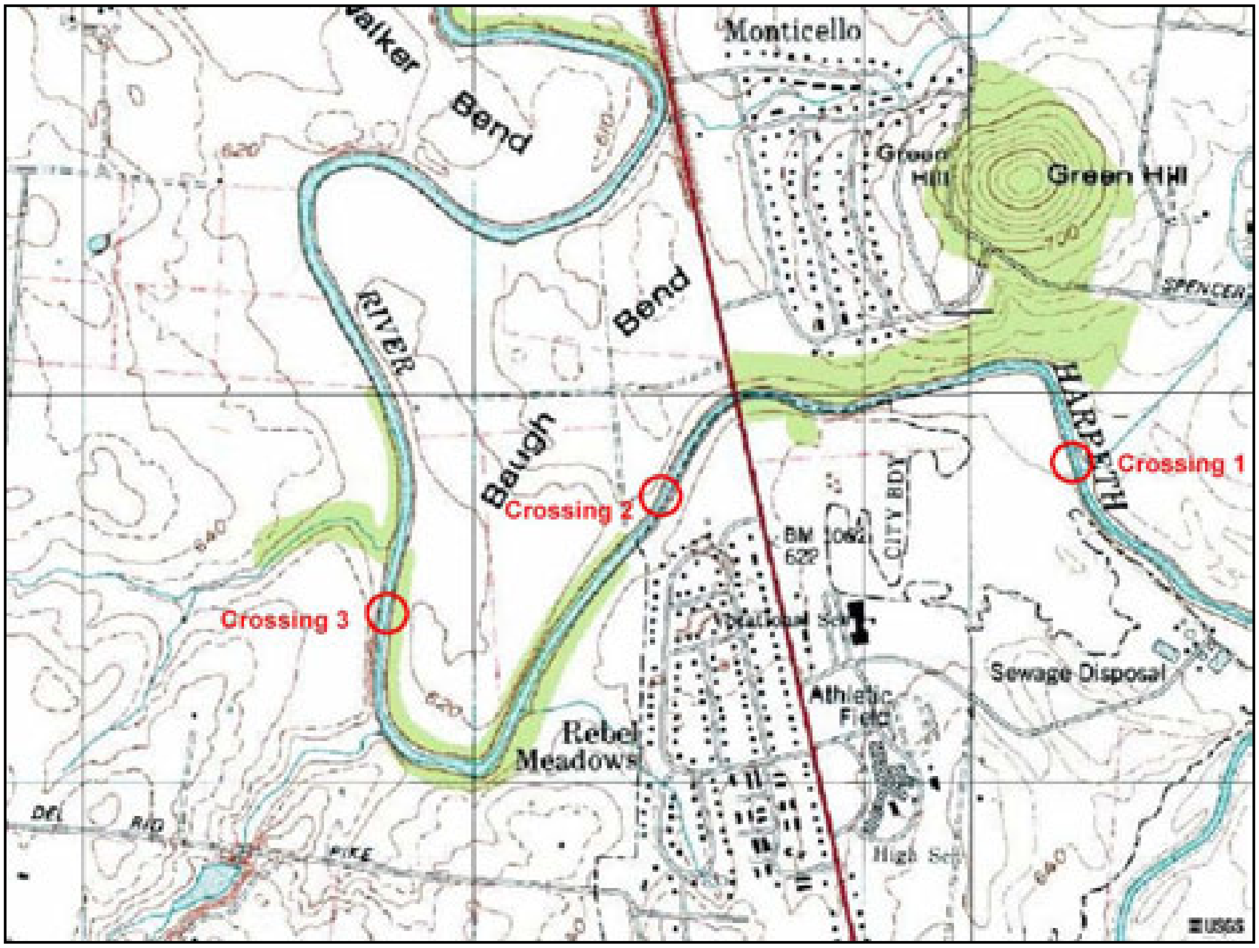

Figure X-1. Aspen Grove - Westhaven 161-kV Transmission Line Crossing Locations

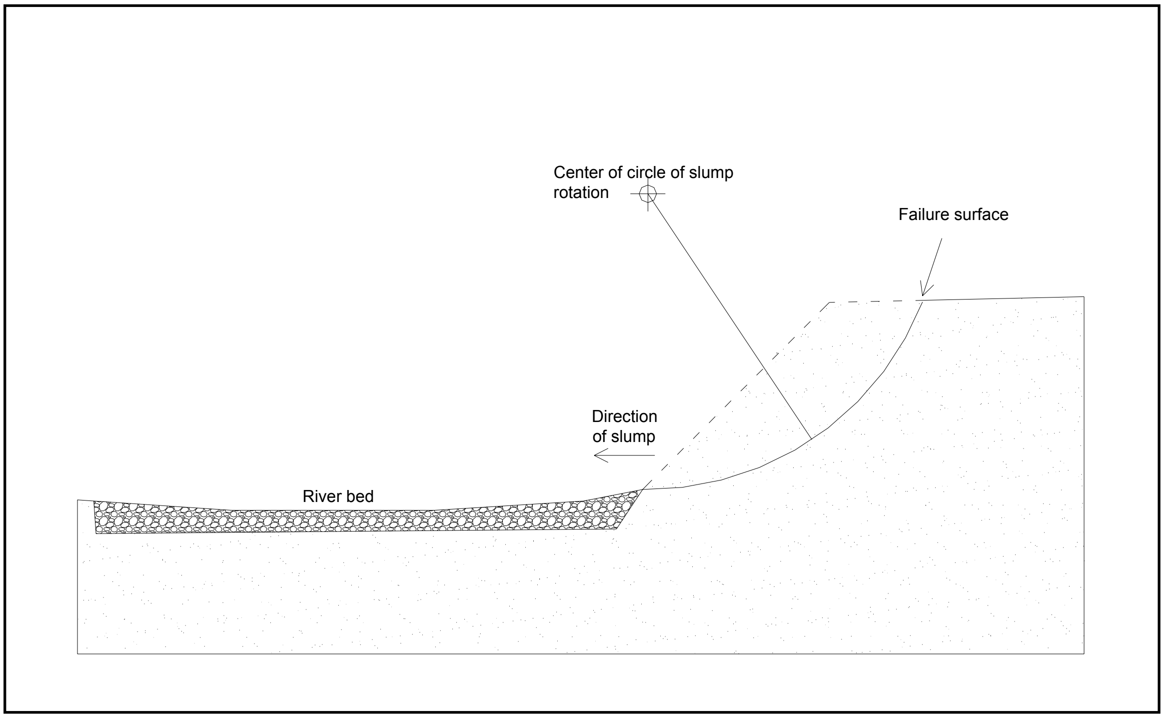

Figure X-2. **Stream Bank Failure Can Lead to Soil Slumping and Sedimentation of the River**

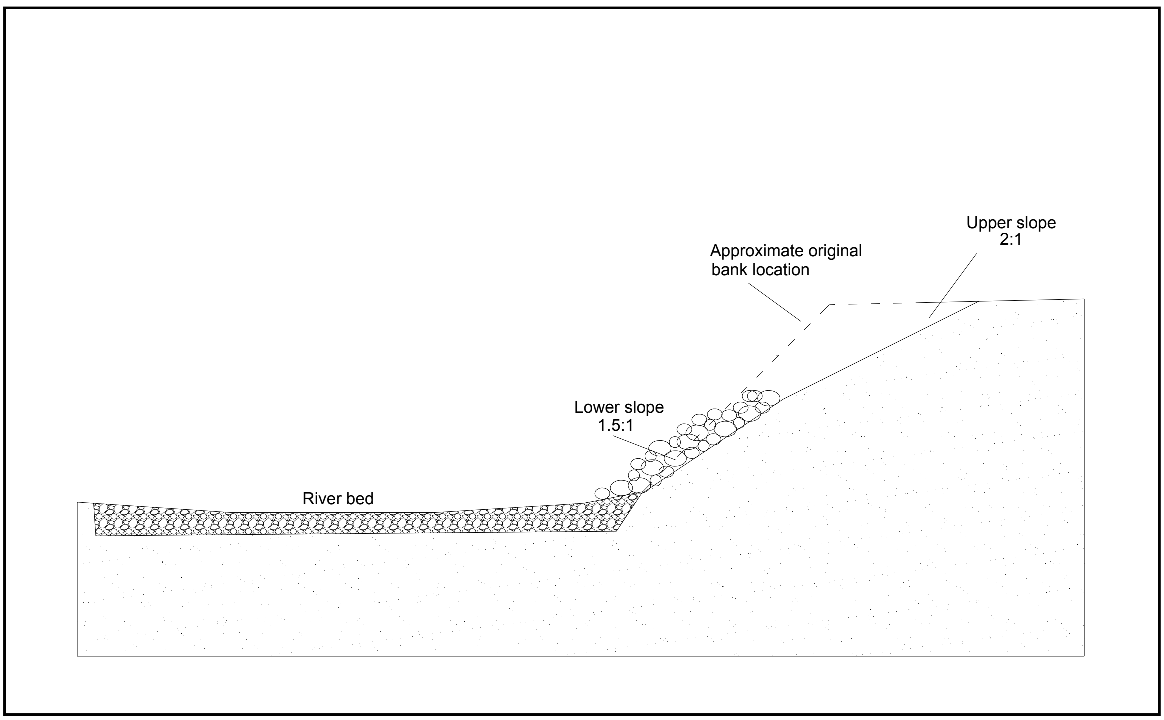

Figure X-3 **Stream Bank Stabilization Methods to Prevent Bank Failure**

Stabilization Methods

Special stream bank stabilization considerations are necessary to prevent erosion on both banks of the Harpeth River at crossing 3 (3-East and 3-West) because of the high, steep banks and silty soil. In addition, conditions on the west bank of crossing 2 (2-West) should be carefully evaluated before construction, with these additional practices put in place if necessary.

Grading - The upper two-thirds (approximately) of the bank would be sloped to about 2 horizontal to 1 vertical to allow the safe access by the construction equipment performing the work. The lower third of the bank would be shaped to an average slope of about 1.5 to 1. This slope minimizes the total amount of excavation while creating a stable slope for the rock and minimizing the amount of rock in the channel.

Upstream and downstream ends of the excavation, uphill from the area on which the rock would be placed, would be tapered into the natural ground surface so that no steep banks are left. On the lower part of the bank, tapering can be accomplished with the rock.

Rock - A temporary filter fabric would be placed before rock installation. This filter would consist of coconut fiber (coir) with biodegradable thread (for example North American Green C125BN or Rolanka BioD-OCF30).

Rock would be predominantly 1- to 2-foot diameter (100 to 800 pounds). Rock depth would be at least 2 feet. Rock would be placed to minimize the movement of filter fabric.

Soil may be placed on the rock to fill voids. Soil should be swept off the top of rocks so that it is not exposed directly to flowing water. This soil should be seeded with species specified below soon after it is placed.

Upper slope treatment - All exposed soil below the elevation at the top of banks would be seeded with a mixture consisting of the grass and forb species listed below. After seeding, an erosion control mat made of coconut fiber or coconut fiber and straw mix with biodegradable thread would be placed over the seed and secured with 12-inch wooden pegs (longer if necessary) on 3-foot centers. The uphill edge of the mat would be secured in a 1-foot-deep trench.

Above the top of the bank, all exposed soil would be seeded with the native species listed below, or with introduced grass species, as appropriate. Seed would be mulched with straw.

Follow up - Selected shrub species should be planted during the dormant season after construction.

Plant Species Planned for Erosion Control

Live stakes - The lower section of the stream banks where trees have been removed would utilize live stakes. These are less likely to be washed out by high flows than are bare-root plants. Locally harvested material is preferred, but some species are also available commercially.

- Shrub species of dogwood (*Cornus foemina*)
- Willows (*Salix nigra, S. caroliniana, S. sericea, S. exigua/interior*)
- Ninebark (*Physocarpus opulifolius*)
- Eastern cottonwood (*Populus deltoides* – probably too tall for this application)

Small trees and shrubs - The following are available as bare-root stock from regional state forestry nurseries.

- Buttonbush (Va.)
- River birch (N.C. and Va.)
- Hazel alder (N.C.)
- Persimmon (Tenn.)
- Ninebark (Tenn.)

Grasses and forbs - A good ground cover is necessary while woody plants become established. Some of the following species are shade tolerant, so they would not be completely eliminated as the canopy develops. The following are all available as seed from ernsteed.com.

- Wildrye (*Elymus virginianus, E. riparius*, *E. hystrix* for bank; *E. villosus* for more upland areas)
- Deertongue (*Panicum clandestinum*)
- River oats (*Chasmanthium latifolium*)
- Smartweed (*Polygonum pensylvanicum*)
- Partridge pea (*Chamaechrista fasciculata*)
- Annual ryegrass, or small grain (rye, oats, or wheat) for initial cover and nursery